SIR438DP-VB Datasheet

N-Channel 150 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω) Max.	I_D (A)[g]	Q_g (Typ.)
150	0.0158 at V_{GS} = 10 V	53.7	22.8 nC
	0.0188 at V_{GS} = 7.5 V	45	

FEATURES

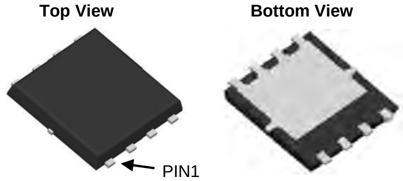
- Trench Power MOSFET
- 100 % R_g and UIS Tested

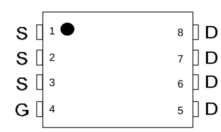
RoHS COMPLIANT
HALOGEN FREE

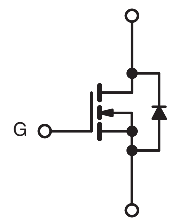
APPLICATIONS

- Fixed Telecom
- DC/DC Converter
- Primary and Secondary Side Switch

DFN5X6







N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	150	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	53.7	A
	T_C = 70 °C		43	
	T_A = 25 °C		12.8[b, c]	
	T_A = 70 °C		10.2[b, c]	
Pulsed Drain Current (t = 300 µs)		I_{DM}	130	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	60[a]	
	T_A = 25 °C		5.6[b, c]	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	30	
Single Pulse Avalanche Energy		E_{AS}	45	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	104	W
	T_C = 70 °C		66.6	
	T_A = 25 °C		6.25[b, c]	
	T_A = 70 °C		4[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)[d, e]			260	

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[b, f]	t ≤ 10 s	R_{thJA}	15	20	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	0.9	1.2	

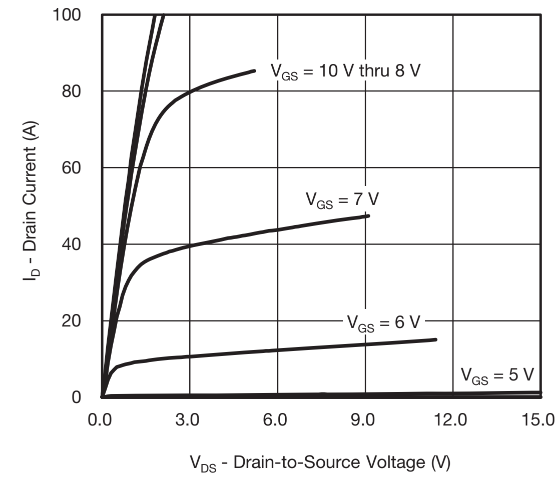
Notes:
a. Package limited.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. The DFN5x6 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
e. Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
f. Maximum under steady state conditions is 54 °C/W.
g. T_C = 25 °C.

SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	150			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		105		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 9.4		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250 µA	2.0		4.0	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 150 V, V_{GS} = 0 V			1	µA
		V_{DS} = 150 V, V_{GS} = 0 V, T_J = 70 °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 10 V	40			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		0.0158		Ω
		V_{GS} = 7.5 V, I_D = 15 A		0.0188		
Forward Transconductance[a]	g_{fs}	V_{DS} = 10 V, I_D = 20 A		30		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz		1286		pF
Output Capacitance	C_{oss}			327		
Reverse Transfer Capacitance	C_{rss}			28		
Total Gate Charge	Q_g	V_{DS} = 75 V, V_{GS} = 10 V, I_D = 20 A		31.3	47	nC
		V_{DS} = 75 V, V_{GS} = 7.5 V, I_D = 20 A		22.8	35	
Gate-Source Charge	Q_{gs}			8		
Gate-Drain Charge	Q_{gd}			10		
Output Charge	Q_{oss}	V_{DS} = 75 V, V_{GS} = 0 V		66	100	
Gate Resistance	R_g	f = 1 MHz	0.3	1	2	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 75 V, R_L = 3.75 Ω $I_D \cong$ 20 A, V_{GEN} = 10 V, R_g = 1 Ω		10	20	ns
Rise Time	t_r			12	24	
Turn-Off Delay Time	$t_{d(off)}$			15	30	
Fall Time	t_f			7	14	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 75 V, R_L = 3.75 Ω $I_D \cong$ 20 A, V_{GEN} = 7.5 V, R_g = 1 Ω		12	24	
Rise Time	t_r			13	26	
Turn-Off Delay Time	$t_{d(off)}$			17	34	
Fall Time	t_f			8	16	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			60	A
Pulse Diode Forward Current[a]	I_{SM}				100	
Body Diode Voltage	V_{SD}	I_S = 5 A		0.77	1.1	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 20 A, dI/dt = 100 A/µs, T_J = 25 °C		95	190	ns
Body Diode Reverse Recovery Charge	Q_{rr}			280	560	nC
Reverse Recovery Fall Time	t_a			72		ns
Reverse Recovery Rise Time	t_b			23		

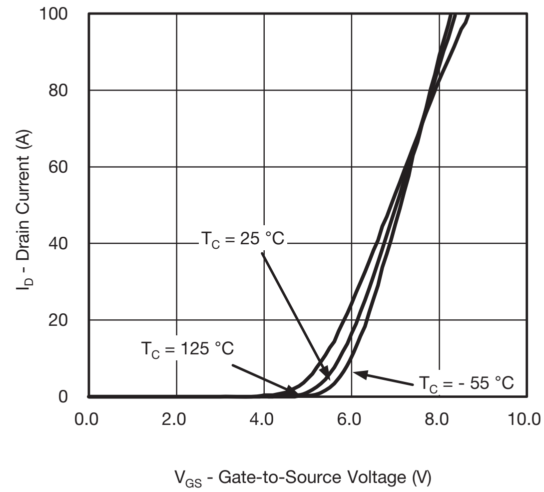
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

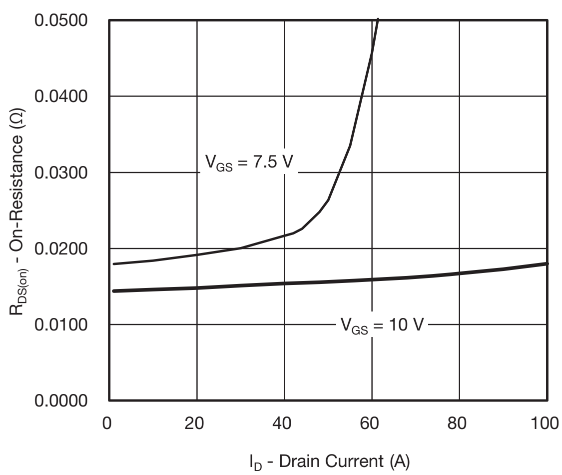
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



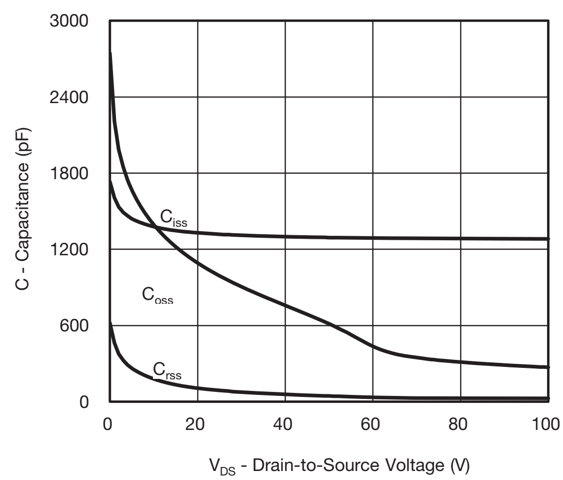
Output Characteristics



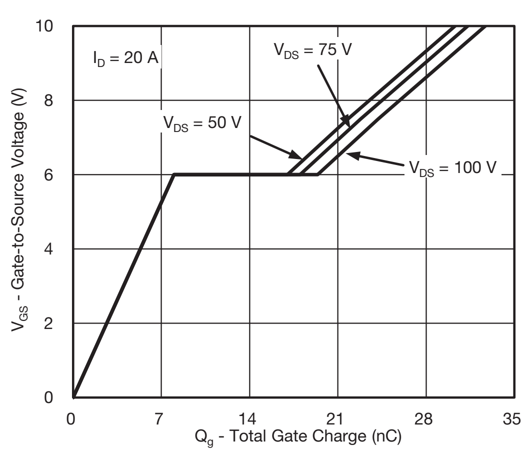
Transfer Characteristics



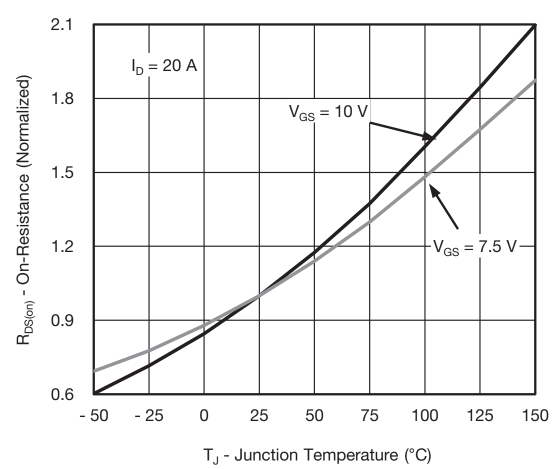
On-Resistance vs. Drain Current



Capacitance

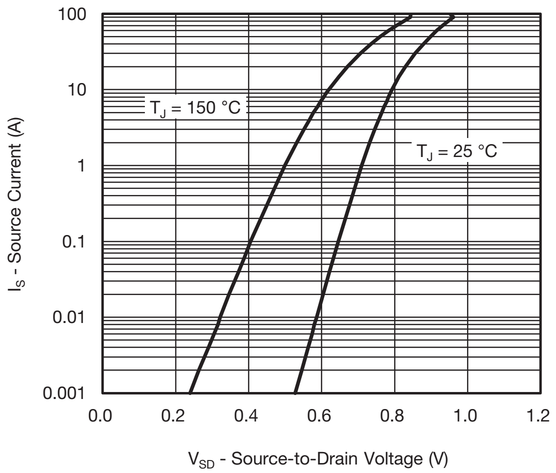


Gate Charge

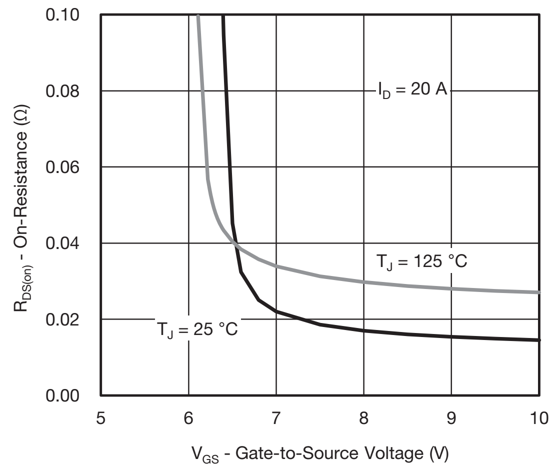


On-Resistance vs. Junction Temperature

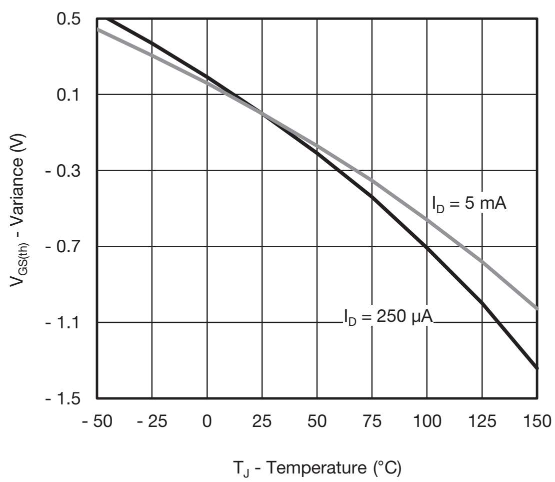
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



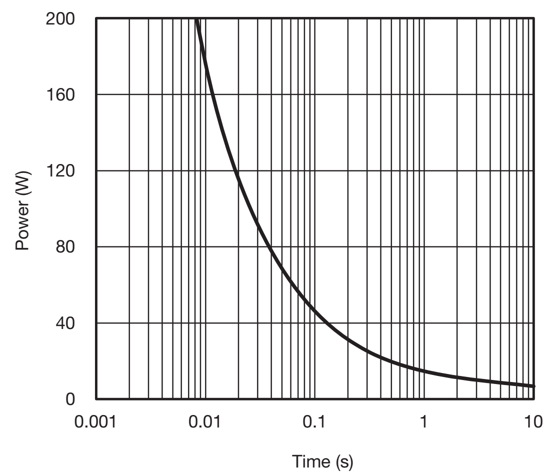
Source-Drain Diode Forward Voltage



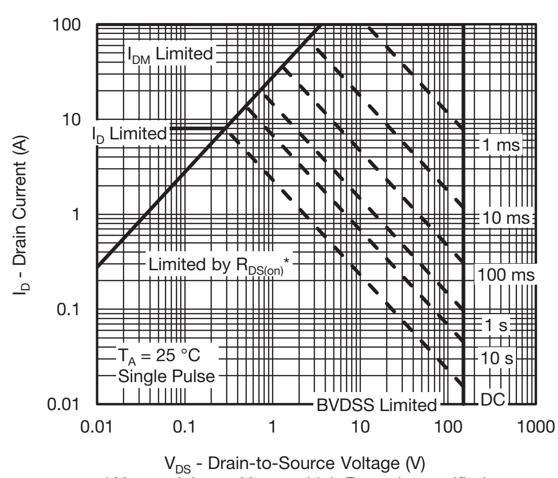
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



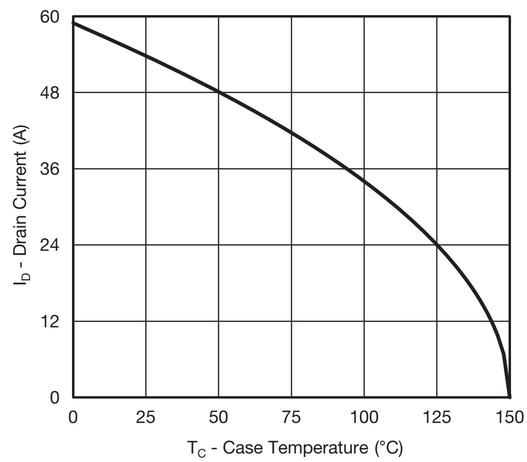
Single Pulse Power, Junction-to-Ambient



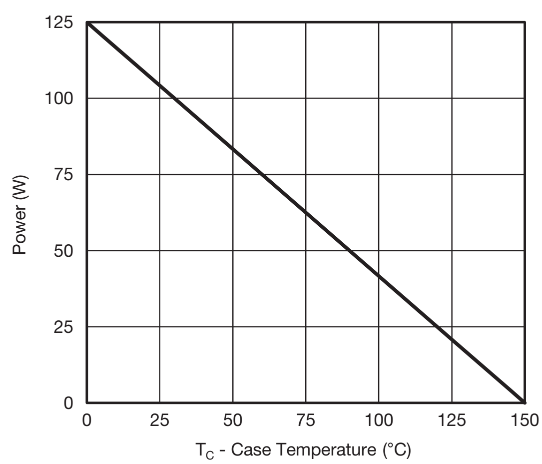
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

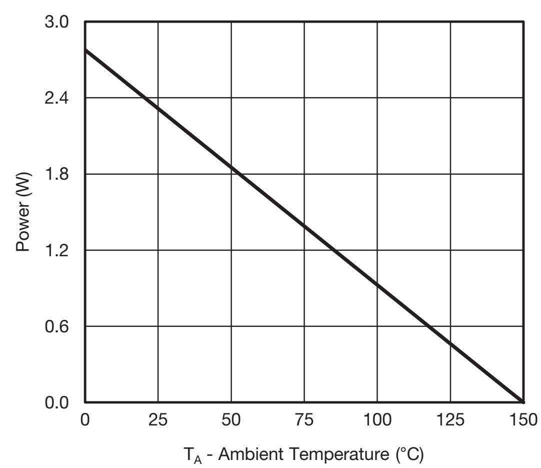
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



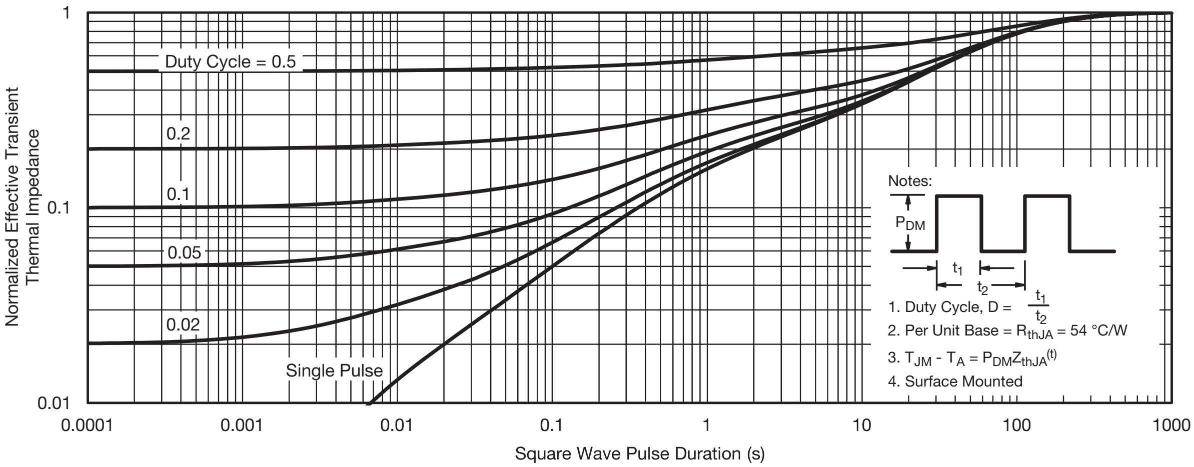
Power, Junction-to-Case



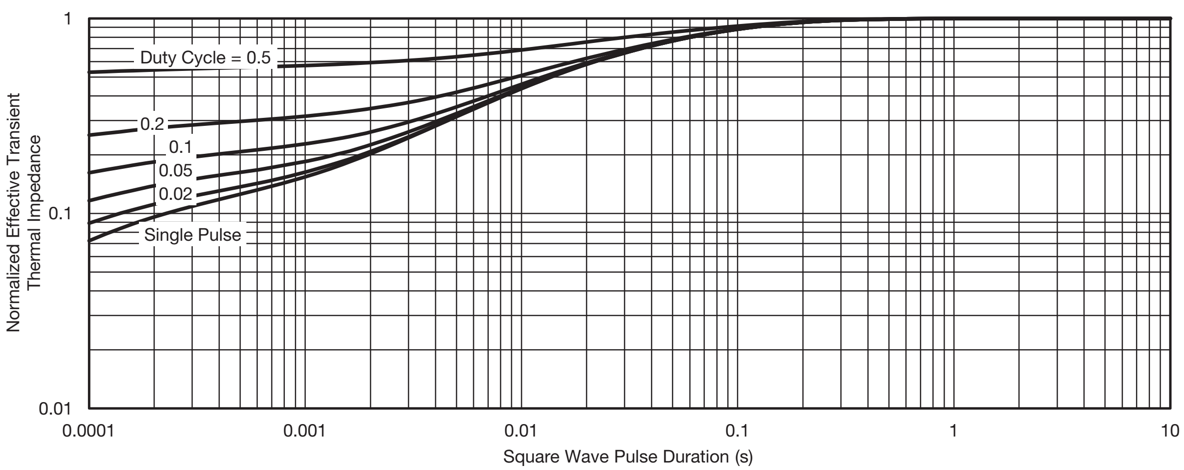
Power, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max.)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

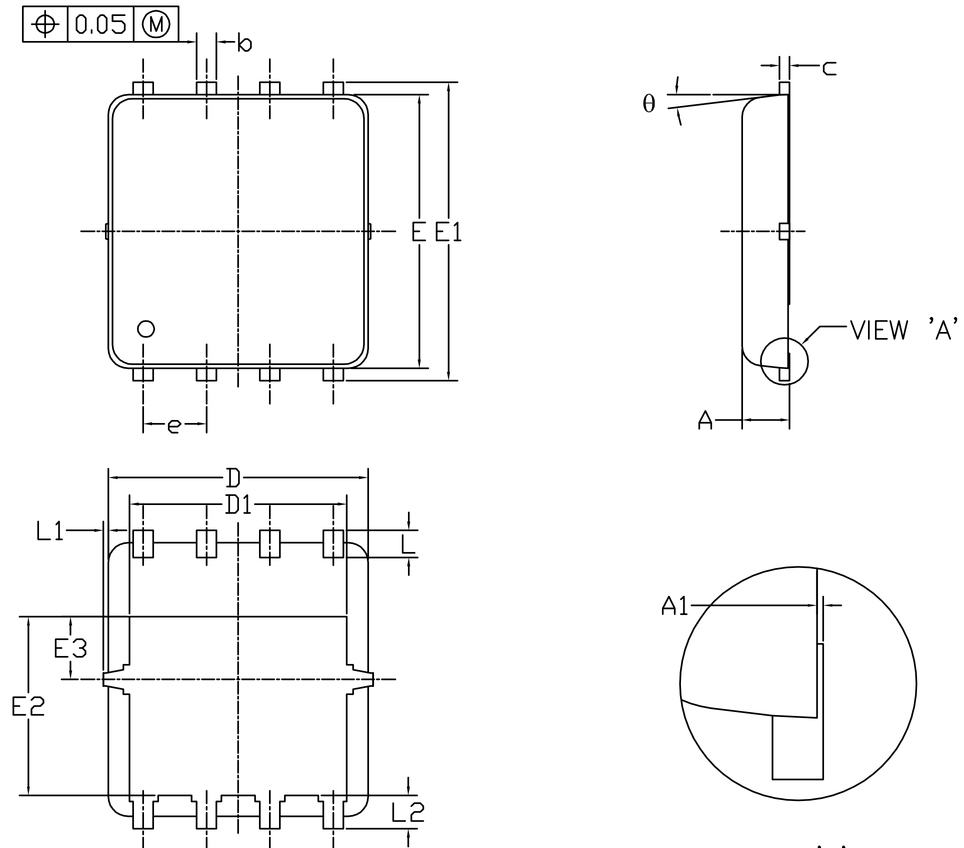


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

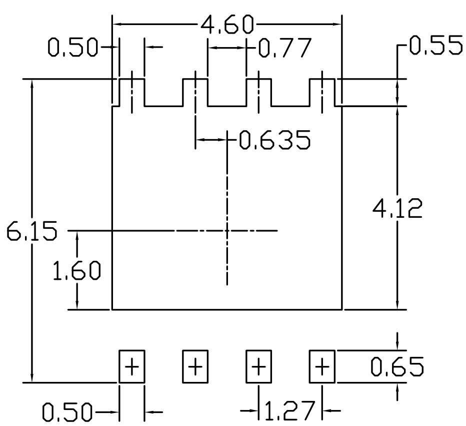
DFN5x6_8L_EP1_P PACKAGE OUTLIN



BOTTOM VIEW

VIEW 'A'
(SCALE 5:1)

RECOMMENDED LAND PATTERN



UNIT: mm

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0. 85	0. 95	1. 00	0. 033	0. 037	0. 039
A1	0. 00	---	0. 05	0. 000	---	0. 002
b	0. 30	0. 40	0. 50	0. 012	0. 016	0. 020
c	0. 15	0. 20	0. 25	0. 006	0. 008	0. 010
D	5. 10	5. 20	5. 30	0. 201	0. 205	0. 209
D1	4. 25	4. 35	4. 45	0. 167	0. 171	0. 175
E	5. 45	5. 55	5. 65	0. 215	0. 219	0. 222
E1	5. 95	6. 05	6. 15	0. 234	0. 238	0. 242
E2	3. 525	3. 625	3. 725	0. 139	0. 143	0. 147
E3	1. 175	1. 275	1. 375	0. 046	0. 050	0. 054
e	1. 27 BSC			0. 050 BSC		
L	0. 45	0. 55	0. 65	0. 018	0. 022	0. 026
L1	0	---	0. 15	0	---	0. 006
L2	0. 68 REF			0. 027 REF		
θ	0°	---	10°	0°	---	10°

NOTE
1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.
   MOLD FLASH AT THE NON-LEAD SIDES SHOULD BE LESS THAN 6 MILS EACH.
2. CONTROLLING DIMENSION IS MILLIMETER.
   CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

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